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Three New Species of *Psaltoda* Stål from Eastern Australia (Hemiptera: Cicadoidea: Cicadidae)

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ABSTRACT. *Psaltoda antennetta* n.sp. and *P. maccallumi* n.sp. are cicadas restricted to rainforest habitats in northeastern Queensland. *Psaltoda mossi* n.sp. is far more widespread, ranging through eastern Queensland to northern New South Wales. *Psaltoda antennetta* is remarkable for its foliate antennal flagella, an attribute almost unique among the Cicadoidea. Relationships of these three species are discussed and a revised key to all *Psaltoda* species provided.

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The genus *Psaltoda* Stål is endemic to eastern Australia. Twelve species have been recognised previously (Moulds, 1990; Moss & Moulds, 2000). Three additional species are described below including one that differs notably from other *Psaltoda* species (and nearly all other Cicadoidea) in having foliate antennal flagella.

In a previous review of the genus (Moulds, 1984) a key was provided to the species then known. That key is here revised.

Collections where specimens are house are abbreviated as follows: AE, private collection of A. Ewart, Brisbane; AM, Australian Museum, Sydney; ANIC, Australian National Insect Collection, Canberra; ASCU, Agricultural Scientific Collections Unit, NSW Agriculture, Orange; BMNH, The Natural History Museum, London; DE, private collection of D. Emery, Sydney; JM, private collection of J. Moss, Brisbane; JO, private collection of J. Olive, Cairns; LWP, private collection of L.W. Popple, Brisbane; MC, private collection of M. Coombs, Brisbane; MNHP, Museum national d'Histoire naturelle, Paris; MSM, author's collection; MV, Museum of Victoria, Melbourne; QM, Queensland Museum, Brisbane; UQIC, University of Queensland Insect Collection, St Lucia. Names of collectors of specimens are abbreviated as follows: JM, J. Moss; MBM, M.S. & B.J. Moulds; WH, A. & M. Walford-Huggins; AH, A. Hiller; AE, A. Ewart and EA, E.E. Adams.

Measurements (in mm) are given as a range and mean, and include the smallest and largest available specimens.

Key to species of *Psaltoda*

1 Hind wings infuscated apically 2
—— Hind wings not infuscated apically 8

2 Head not black behind ocelli 3
—— Head black behind ocelli 4

3 Fore wings with infuscation overlaying longitudinal veins at their junction with ambient vein ..... *adonis* Ashton
—— Fore wings without infuscation overlaying longitudinal veins at their junction with ambient vein ..... *fumipennis* Ashton

4 Lateral ocelli with at least a brown spot adjacent, the brown often more extensive ..... *flavescens* Distant
—— Lateral ocelli with black adjacent all around 5

5 Head with a black bar of near uniform width for its length between lateral ocellus and eye ..... *magnifica* Moulds
—— Head either entirely jet black or with a black bar widening gradually from lateral ocellus to eye 6

6 Abdomen dorsally dominantly orange (dull brown on discoloured specimens) ..... *aurora* Distant
—— Abdomen dorsally black or nearly so 7

7 Rostrum reaching clearly beyond distal ends of hind coxae ..... *moerens* (Germar)
—— Rostrum not reaching or just reaching distal ends of hind coxae ..... *pictibasis* (Walker)

8 Rostrum reaching to, or beyond, distal ends of hind coxae ..... *harrisii* (Leach)
—— Rostrum not reaching distal ends of hind coxae 9

9 Abdomen dorsally black or nearly so 10
—— Abdomen dorsally not dominantly black, usually light to mid brown or banded black and brown 13

10 Head and thorax dorsally with prominent light yellow (sometimes pale brown) markings very clearly defined ..... *insularis* Ashton
—— Head and thorax dorsally with markings subdued, never light yellow and usually not clearly defined 11

11 Mid-dorsal head length greater than, or sometimes equal to, that of pronotum excluding pronotal collar ..... *mossi* n.sp.
—— Mid-dorsal head length less than that of pronotum excluding pronotal collar 12

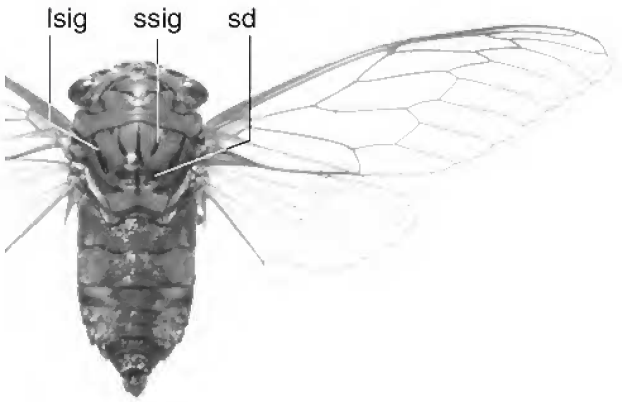
12 Fore wing with infuscation at bases of apical cells 2 and 3 ..... *plaga* (Walker), dark form
—— Fore wing without infuscation ..... *claripennis* Ashton, dark form

13 Antennae bristle-like 14
—— Antennae foliate distally ..... *antennetta* n.sp.

14 Fore wing with infuscation at bases of apical cells 2 and 3 and sometimes also on longitudinal veins meeting ambient vein 15
—— Fore wing without infuscation 16

15 Black bar from eye towards ocelli meeting black surrounding median ocellus ..... *plaga* (Walker), green form
—— Black bar from eye towards ocelli not reaching black surrounding median ocellus ..... *maccallumi* n.sp.

16 Length of fore wing less than 3× its breadth; male opercula usually separated but sometimes contiguous ..... *brachypennis* Moss & Moulds
—— Length of fore wing at least 3× its breadth; male opercula usually overlapping but sometimes only contiguous ..... *claripennis* Ashton, green form, or female of dark form.



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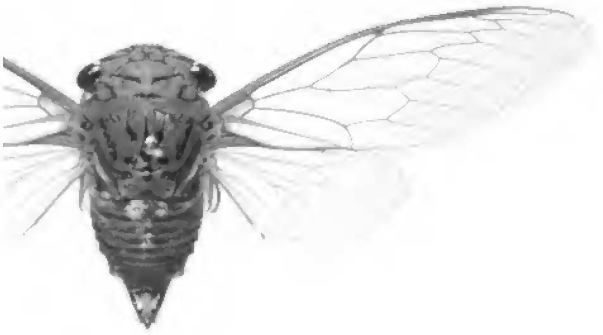

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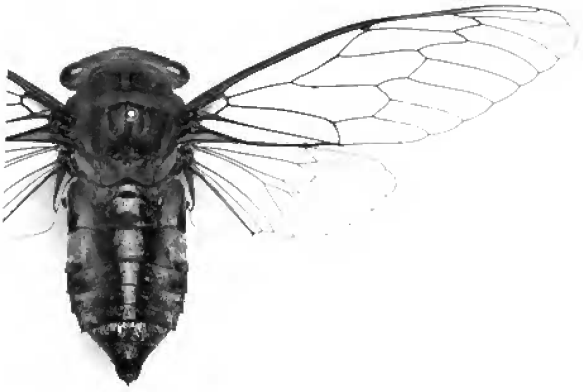

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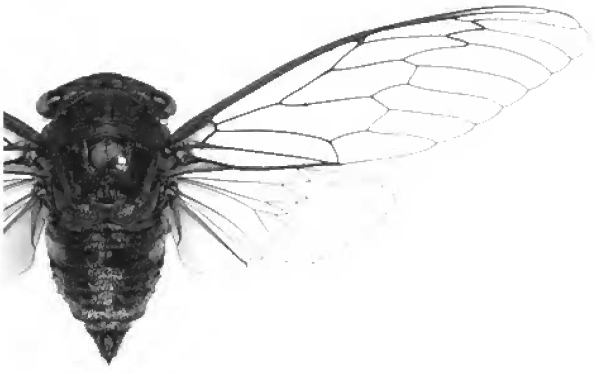

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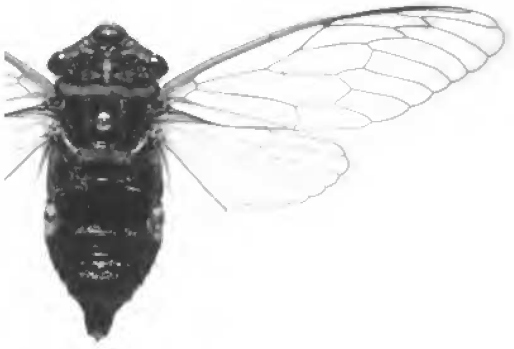

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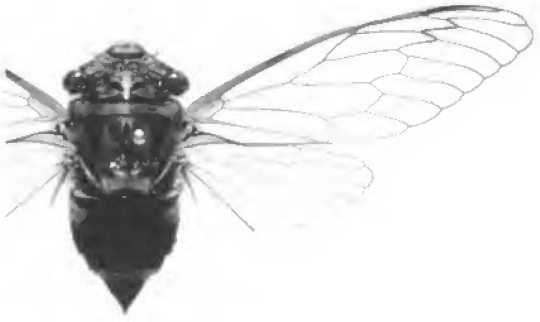

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Figures 1–6. Adults, dorsal view. 1, *Psaltoda antennetta*, male; 2, same, female. 3, *Psaltoda maccallumi*, male; 4, same, female. 5, *Psaltoda mossi*, male; 6, same, female. Approximately 1.3× life size. lsig, lateral sigilla; sd, scutal depression; ssig, submedian sigilla.

Psaltoda antennetta n.sp.

Figs 1, 2, 7, 8, 9, 15

Type material. HOLOTYPE male, Tully Falls, S of Ravenshoe, N.Qld, 11.i.1977, M.S. & B.J. Moulds, K 173149 (**AM**). PARATYPES as follows: QUEENSLAND (northeastern): 1♀, Lock Creek, Davies Ck Rd, Lamb Range, Mareeba Dist., 25.xii.1976, MBM; 1♂, Copperlode Dam clearing, Whitfield Range, Cairns, 24.i.1973, WH (**AM**). 2♀, 20 miles W. of Tully, 20.iv.1964, I.F.B. Common & M.S. Upton; 1♂, 1♀, Palmerston Nat. Park, 17 miles SW of Innisfail, 21.xii.1976, R. Dobson; 1♂, W. slopes of Seymour Ra. Dinner Ck Rd nr. Innisfail, 150ft, 3.xi.1966, E. Britton (**ANIC**). 1♀, Mt Hartley, nr Rossville, S of Cooktown, 1.i.1984, MBM; 1♂, "Pilgrim Sands", Cape Tribulation, 24.v.1983, J. Frazier, D. Clyne; 1♂, 2♀, Mt Lewis, nr Julatten, i.1986, S. Lamond; 2♂, Julatten, NE of Mt Molloy, 20.ix.1987, 2.xii.1987, Walford-Huggins; 1♀, Julatten, foot of Mt Lewis Rg, 8.ii.1981, A. Walford-Huggins; 1♂, Julatten, 3.iii.1982, MBM; 2♂, 1♀, Davies Ck, nr Mareeba, 650 m, rainforest, 7.i.1980, A. Hiller; 1♀, Davies Ck Rd, nr Mareeba, 8.i.1980, Graham Wood; 1♂, 1♀, Lock Creek, Davies Ck Rd, Lamb Range, Mareeba Dist., 25.xii.1976, MBM; 1♂, 1♀, Lock Creek, Davies Ck Rd, Lamb Range, Mareeba Dist., 29.xii.1977, A. Hiller; 1♂, Mt Fisher, nr Milla[a] [Millaa], 10.xii.1978, WH; 1♀, Mt Fisher, 8 km SW of Millaa Millaa, 21.xi.1979, MBM; 1♂, Zillies Falls, 16 km NE of Millaa Millaa, 650 m, rainforest, 18.i.1980, A. Hiller; 1♂, nr The Crater, 20 km S of Atherton, 29.xi.1987, D.A. Lane; 1♀, Baldy Mtn, Atherton, 8.xii.1977, A. Walford-Huggins; 1♂, Herberton, 1.xii.1980, G. Wood; 1♂, Ravenshoe, i.1986, S. Lamond; 2♂, Tully Falls, S of Ravenshoe, 12.xii.1976, M. Walford-Huggins; 1♂, Tully Falls, Atherton Tablelands, rainforest, 27.xii.1979, A. Hiller; 1♂, 1 km N Tully Falls, 8.i.1976, A. & M. Walford-Huggins; 1♂, Copperlode Dam clearing, Whitfield Range, Cairns, 24.i.1973, WH; 2♂, Whitfield Range, Cairns, 24.i.1973, 3.i.1975, WH; 1♂, Crystal Cascades nr Redlynch, 14.xii.1975, B. Brunet; 1♀, Mt Bartle Frere, NW Peak, xii.1985, G. Sankowsky; 1♀, 30 km NW of Kennedy, 800 m, rainforest by creek, 24.xii.1979, A. Hiller; 1♀, 15 km W of Kennedy, 650 m, rainforest, 26.i.1980, A. Hiller; 1♂, nr Mt Fox, SW of Ingham, edge of rainforest, and *Eucal. grandis*, 550 m, 22.xii.1986, J. Young (**MSM**). 2♀, Julatten, i.1981, JM; 1♂, 21 km NE of Atherton, 18.xi.1981, J. Balderson; 1♀, Tully Falls Rd, Ravenshoe, 8.ii.1980, R.I. Storey; 1♀, Gordonvale (Goldsborough Rd, Upper Mulgrave R.), 26.xii.1981, JM (**JM**). 1♀, Tully, 24.iv.1931, A.N. Burns (**MV**). 1♂, Rifle Ck at Black Mtn, 18 km ESE Julatten, 13–14.iv.1982, RF, 400 m, Monteith, Yeates & Cook; 1♀, Bellenden-Ker Range, 5 km S Cable Tower No7, 500 m, 17–24.x.1981, Earthwatch/Qld Museum (**QM**).

Distinguishing characters. The markedly foliate antennae (Fig. 7) clearly separate this species from all others. Males have a wide gap between the opercula and tymbal covers, a feature shared within *Psaltoda* only with *maccallumi* and *brachypennis*. See also Distinguishing Characters under *P. maccallumi*.

Description

Male (Figs 1, 7, 8, 9). *Head.* Mid brown tending partly green on some individuals, live specimens always partly green; posterior margin of head partly or entirely edged black; ocellar triangle black, sometimes expanded to posterior margin of head and sometimes with an anterior "finger" either side of median ocellus directed towards lateral margins of postclypeus; a broad black fascia on vertex from eye to ocellar tubercle where it meets a short black transverse fascia that sometimes extends to posterior margin of head; narrow black margin to eyes above; usually a short black fascia dorsally on antennal plates; sometimes a black mark below antennal cavity. Postclypeus glossy; yellowish brown, a broad black fascia dorsally across base, ventral midline black, transverse ridges edged black becoming less so or unmarked nearing anteclypeus. Anteclypeus glossy; yellowish brown, usually with a little black adjacent to postclypeus in vicinity of midline. Rostrum with labrum black, mentum yellowish brown to mid brown, otherwise yellowish brown to dark brown becoming black apically; reaching just beyond bases of hind coxae. Eyes of live specimens light reddish brown. Antennae (Fig. 7) with segment 3 mildly compressed laterally; segments 4 and 5 strongly compressed; segments 6–8 markedly flattened, spatulate, 6 very broad and long, 7 considerably smaller, 8 very small.

Thorax. Pronotum mid brown tending green on some individuals, pronotal collar often green and possibly always so on live specimens; median and lateral fissures black; posterior transverse fissure black around dorsal midline and laterally below junction with lateral groove; on some individuals a paramedian pair of black fascia expanded laterally at both ends, reaching pronotal collar but never to anterior margin of pronotum. Mesonotum similar in colour to pronotum; midline with a black fascia broadest a little anterior of cruciform elevation and often extending partly onto cruciform elevation; posterior margin of cruciform elevation sometimes edged black across dorsal region; lateral sigilla incompletely marked, black along outer margin only, the black increasing in width towards apex; submedian sigilla incompletely marked, black along outer margin, to a lesser extent across base and sometimes partly along inner margin, the black irregular in outline; scutal depressions boldly marked black; wing grooves black. Underside of thorax mid brown, often substantially covered by silver pubescence.

Wings. Hyaline, usually with very faint smoky tint, usually without infuscations but occasionally present on veins forming bases of apical cells 2 and 3. Fore wing venation brown, 2A+3A black or partly so, some individuals with veins R+Sc, M, CuA and CuP+1A green or partly so; basal cell translucent brown, darkest on anterior half; basal membrane dark brown. Hind wing venation usually brown, sometimes partly green; plaga on 3A black, almost reaching distal end of 3A; plaga on 2A black, very narrow, reaching full length.

Legs. Glossy; dominantly yellowish brown or greenish, partly black or dark brown. Fore legs with femoral primary spine short, rounded and not lying flat, secondary spine barely developed; browning at distal end of tibia; tarsus black or dark brown; pretarsal claws dark brown and black. Mid legs similar to fore legs but black reduced. Hind legs lacking black except on spines and pretarsal claws. Meracantha yellowish brown.

Opercula. Triangular, lateral and hind margins almost straight, lateral angle near a right-angle; meeting or overlapping; glossy; yellowish brown.

Abdomen. Tergites tending glossy; light brown; tergites 1 and 2 with narrow black edgings at their junction in dorsal region; tergites 2 and 3 with narrow black edgings for the length of their junction; tergites 2–8 black on anterior margins, broadest in dorsal region, but for the most part concealed unless abdomen is extended; tymbal covers distant from opercula; mid brown. Sternites glossy; yellowish brown; anterior margin of sternite 3 narrowly edged black. Spiracles white.

Genitalia (Figs 8, 9). Thickening of lower rim of pygofer considerable, more than twice thickness of remainder. Pygofer basal lobe lying tight against upper lobe; upper lobe not well developed, broad but very short, very rounded in lateral view. Uncus with distal expansion occupying around half the length of uncal median lobe; distal margin of uncal median lobe in dorsal view strongly V-shaped; in lateral view nearly straight along dorsal midline and with the ventral distal expansion not markedly bulging (compare Figs 8 and 12). Aedeagus similar to that of other *Psaltoda* species.

Female (Fig. 2). Similar to male except abdomen tending darker; black on the tergites a little more extensive. Abdominal segment 9 with a large black subdorsal marking on anterior half fused dorsally at anterior margin, ventral margin usually black; caudal spine and distal margin of segment 9 black; stigma black. Ovipositor sheath black; terminating before apex of caudal spine.

Measurements. n = 10♂, 10♀ (includes largest and smallest of available specimens). *Body length*: male 24.6–31.8 (29.0); female 24.4–28.8 (26.2). *Fore wing length*: male 34.8–39.9 (37.5); female 37.2–41.6 (39.7). *Head width*: male 11.2–13.1 (12.3); female 11.9–13.8 (12.7). *Pronotum width*: male 10.2–11.7 (11.0); female 10.6–12.9 (11.6).

Distribution and habitat (Fig. 15). Northeastern Queensland between Mt Hartley south of Cooktown and Mt Fox southwest of Ingham. The species inhabits primary rainforest, both in the lowlands and the mountains, usually below 1000 m but up to 1470 m. Adults have been taken from mid October to late May.

Etymology. The specific epithet is derived from the word antenna and refers to the unique foliate antennae of this species.

Comments

Although the antennal flagellum of this species is unique within *Psaltoda*, and very unusual within the Cicadoidea, all other characters clearly place it within *Psaltoda*. Notable amongst these characters are the broad head (clearly wider than the mesonotum), a broad pronotal collar with strongly ampliate lateral margins, enlarged abdominal tergites 2 and 3 which account for as much as half the length of the abdomen and very flat male sternites IV–VII. Further, the male genitalia have a distinctive uncal lobe which, in dorsal view is broad with an expanded broad apex, and restraint of the aedeagus is by sinewation of the inner pygofer wall adjacent to the ventral surface of the uncus; attributes shared only with *Anapsaltoda* and *Neopsaltoda*.

Two South American species, *Mendozana antennaria* (Jacobi) and *M. platypleura* Distant, are the only other species known to me with a similarly modified flagellum. The modification differs noticeably between these two species, that of *M. antennaria* is primarily confined to a relatively small expansion of segment 6, while that of *M. platypleura* constitutes a large expansion of 7 and 8 as in *Psaltoda antennetta* n.sp. *Mendozana* species are rather distant phylogenetically from *Psaltoda* (Moulds, in prep) falling within a group of Neotropical genera allied to *Tettigades* Amyot and Serville [recognised by some authors (e.g., Chou *et al.*, 1997) at family or subfamily rank] and differing markedly from *Psaltoda* in having males with tymbal covers absent and abdominal tergites 2 and 3 similar in size to 4–7. Thus, it must be concluded, modification of the distal end of the flagellum has arisen independently in *P. antennetta* and *Mendozana* species.

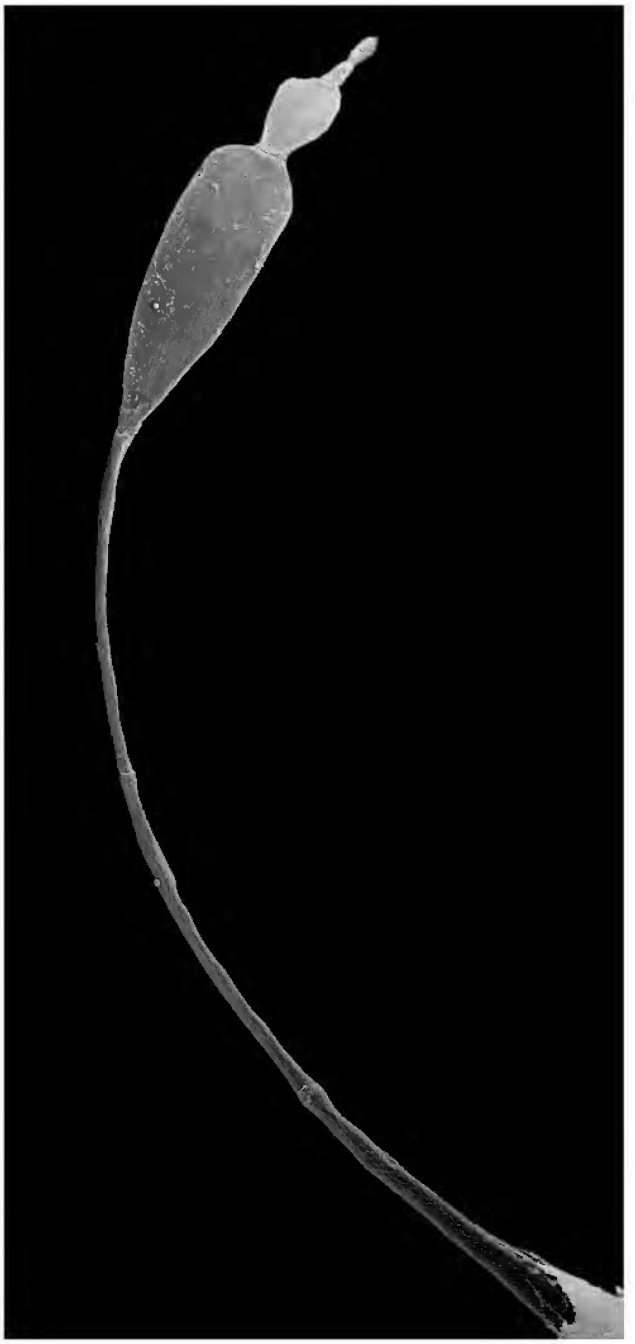


Figure 7. Antennal flagellum of *Psaltoda antennetta* showing foliate distal segments. Magnification 350×.

Psaltoda maccallumi n.sp.

Figs 3, 4, 10, 11, 14

Type material. HOLOTYPE male, Mt Lewis Rd, via Julatten, 11.xi.1987, Walford-Huggins, K 173141 (AM). PARATYPES as follows: QUEENSLAND (northeastern): 1♀, Mt Lewis road, W of Mossman, N.Qld, 25.xii.1987, MBM; 1♀ Mt Lewis Rd, via Julatten, 11.xi.1987, Walford-Huggins; 1♂, Mt Lewis, 22.xii.1985, WH; 1♀, 13 miles, 3,400[feet], Mt Lewis, 8.xi.1975, WH; 1♀, Mt Spurgeon, W of Mossman, 21.xii.1974, M.S. Moulds (MSM).

Distinguishing characters. Clearly distinguished from the closely allied *P. antennetta* by having typical bristle-like antennae. The meracantha are also characteristically black basally with a very pale spine, unlike the meracantha of *P. antennetta* which are entirely pale. Males have the opercula and tymbal covers widely separated, an attribute within *Psaltoda* shared only with *antennetta* and *brachypennis*. *Psaltoda maccallumi* is unique among *Psaltoda* species in having a pair of subapical appendages on the theca of the aedeagus (Figs 10, 11).

Description

Male (Figs 3, 10, 11). Similar to *P. antennetta* n.sp. but differs as follows.

Head with lorum partly black; rostrum reaching to bases of hind coxae, labium entirely black or nearly so; antennae of typical form, i.e. bristle-like.

Pronotum with lateral fissures lacking black or black just discernible; black edging extending along entire posterior transverse fissure.

Wings. Fore wing infuscation at bases of apical cells 2 and 3 usually distinct but never bold.

Legs with the black on fore and mid tibiae and tarsi always intense. Meracantha black basally with pale yellowish spine.

Opercula triangular, lateral margin straight, hind margin weakly curved, lateral angle broadly rounded; overlapping; glossy; yellowish mid brown, edged black along lateral margin.

Abdomen with black markings tending to be more extensive than on *P. antennetta*; black edging to sternite III continued on sternite II.

Genitalia (Figs 10, 11). Thickening of lower rim of pygofer considerable, more than twice thickness of remainder. Pygofer basal lobe not lying tight against upper lobe; upper lobe very rounded in lateral view. Uncus with distal expansion occupying about one third the length of uncal median lobe; distal margin of uncal median lobe in dorsal view broadly V-shaped at just under a right angle, in lateral view near straight along dorsal midline and with ventral distal expansion not markedly bulging (compare Figs 10 and 12). Aedeagus similar to that of all other *Psaltoda* species except for a pair of small, fleshy, spine-like appendages, one each side subapically on the theca.

Female (Fig. 4). Similar to female of *P. antennetta* but differing as for male above. Abdominal segment 9 lacking a black ventral margin.

Measurements. n = 2♂, 4♀ (includes all available specimens). *Body length*: male 33.9–37.5 (35.7); female (including ovipositor) 25.5–28.1 (27.0). *Fore wing length*: male 42.3–43.0 (42.7); female 39.6–43.7 (42.0). *Head width*: male 13.1–13.5 (13.3); female 13.1–14.0 (13.4). *Pronotum width*: male 12.0–12.4 (12.2); female 12.0–13.8 (12.5).

Distribution and habitat (Fig. 14). Known only from the rainforests near Mt Lewis and Mt Spurgeon on the Carbine Tableland, west of Mossman, northeastern Queensland. Adults have been taken during November and December. The species is rarely encountered because adults inhabit rainforest treetops and appear not to be readily attracted to light.

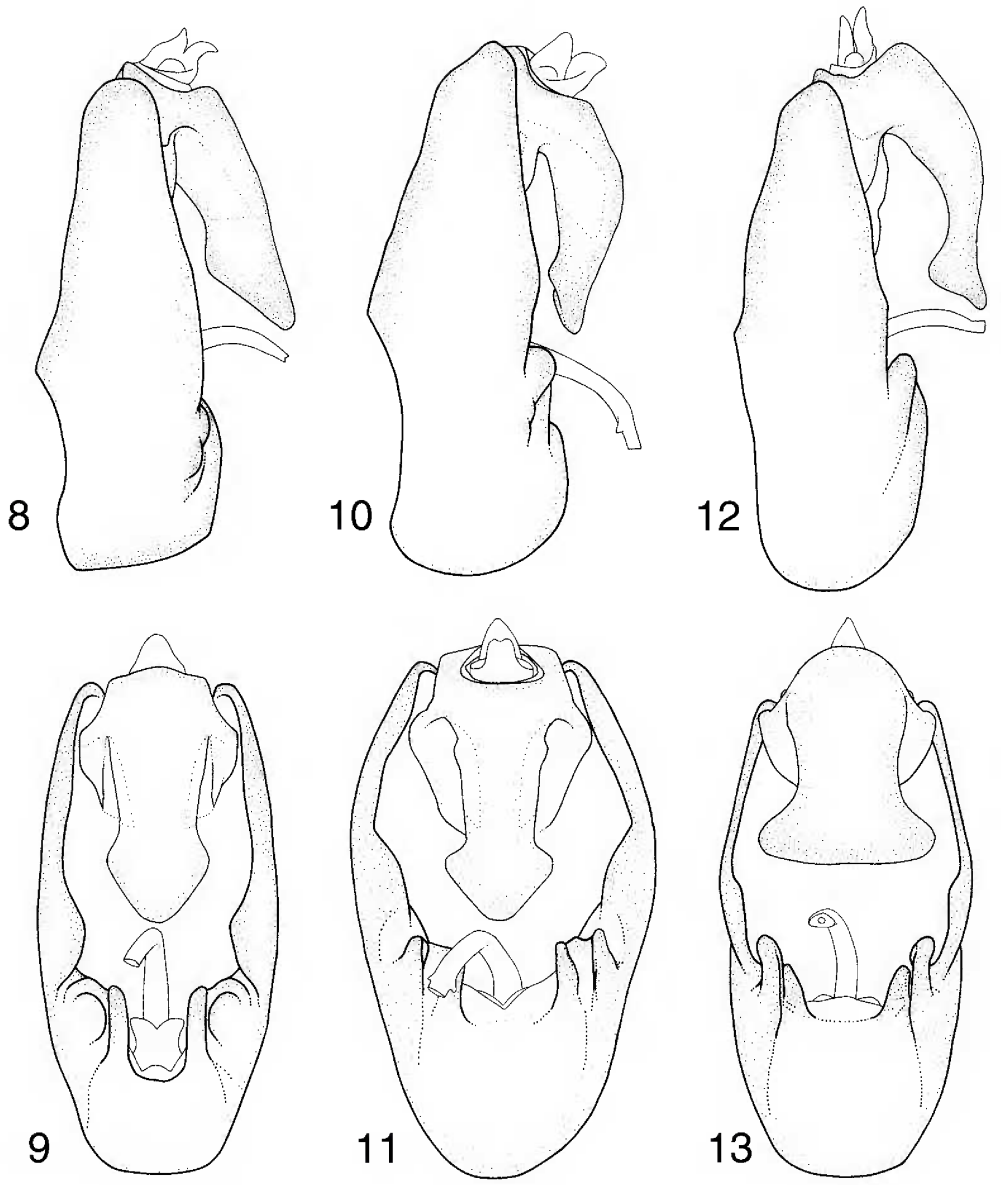
Etymology. Named after the late Mungo MacCallum III, whose enthusiasm for cicadas was at times evident in his outstanding career as a creative writer and radio and television producer.

Psaltoda mossi n.sp.

Figs 5, 6, 12, 13, 14

Psaltoda sp.–A. Ewart (1988), pp. 184–185 (A. Ewart, pers. comm.).

Type material. HOLOTYPE ♂, 4 km E of Mourangee Hsd, nr Edungalba, in dry vine scrub, 28.i.1991, E.E. Adams, K 173142 (**AM**). PARATYPES as follows: QUEENSLAND (southern): 3♂, 3♀, Lake Broadwater, 30 km SW [of] Dalby, on *Angophora*, 27°23'S 151°06'E, 18.xii.1987, A. Ewart; 2♀, Dunmore, 15.xii.1987, A. Hiller; 1♂, 1♀, Auburn-Lithgow Rd. jct. nr. Chinchilla, 9.i.[19]94; 6♀, Barakula SF, nr Chinchilla, virgin brigalow, 36°14.42'S 150°48.86'E, 15.xii.1997 [A.] Ewart; 2♀, Hurdle Gully, 13.3 km WNW [of] Monto, 390 m, 24°55'S 150°59'E, 20.xii.1997, mv lamp, Burwell, Evans, Ewart; 6♂, 12♀, The Amphitheatre, NW Robinson NP, vine scrub, 25°12.67'S 148°59.25'E, 19.xii.1997, [A.] Ewart (**AE**). 1♂, 1♀, 3 km E of Mourangee Hsd, nr Edungalba, 28.xi.1987, 28.i.1991; EA; 1♂, 1♀, 4 km E of Mourangee Hsd, nr Edungalba, in dry vine scrub, 28.i.1991, EA; 1♂, Goodnight Scrub NP nr Tea Tree Lane, 40 km WSW Childers, Araucarian vine scrub, at light, 28–29.x.1999, G. Williams (**AM**). 2♂, 2♀, Lenthall's Scrub, 22 km NW Maryborough (dry vine forest), 2.i.1990, JM (**DE**). 1♂, 2♀, Middle Percy I., Northumberland Group, Gt. B. Rf. Marine Park, 10.xi.1983, JM; 2♂, Lotus Creek, 100 km NW Marlborough 2.ii.72, J. Moss; 8♂, 1♀, Rossmoya, 35 km N Rockhampton, 3.xii.1981, JM; 5♂, 5♀, Blackdown Tableland (below escarpment), 13–20.xii.1985, JM & A. Ewart; 1♂, 1♀, Olsen Caves, 20 km N Rockhampton, 20.xii.1985, JM; 1♂, Carnarvon Gorge, 8–12.xii.1985, JM & A. Ewart; 10♂, 21♀, Lenthall's Scrub, 22 km NW Maryborough (dry vine forest), 2.i.1990, JM; 3♂, 1♀, Pine Creek, c. 20 km S Bundaberg, 18.xi,4.xii.1975, JM; 4♂, 3 km S of Lowood, SEQ, on *Ac. harpophylla*, 8.i.2000, J.T. Moss and L.W. Popple; 1♂, Chinchilla, (in brigalow), 7–8.xii.1987, JM; 1♂, Lake Broadwater 20 km SW Dalby (in brigalow), 20.xii.1987, JM; 3♀, 24 km NW of Mareeba, 24–25.xi.1981, J. Balderson; 1♂, 6♀, Dunmore via Cecil Plains, 30 km S Dalby, 10–12.i.1992, M. de Baar; 1♀, Leyburn, 50 km SW Toowoomba, ii.1994, K.L. Dunn; 1♂, Kalbar via Boonah, 17–19.xii.1998, JM and L. Popple (**JM**). 1♂, 1♀, Lenthall's Scrub, 22 km NW Maryborough (dry vine forest), 2.i.1990, JM; 2♂, 2 km S of Lowood, on *Bursaria spinosa*



Figures 8–13. Male genitalia. 8, *Psaltoda antennetta*, lateral view; 9, same, ventral view. 10, *Psaltoda maccallumi*, lateral view; 11, same, ventral view. 12, *Psaltoda mossi*, lateral view; 13, same, ventral view.

(adjacent vine scrub), 14.xii.1998, L.W. Popple; 3♂, 3 km S of Lowood, on *Ac. harpophylla* (brigalow), 8.i.2000, L.W. Popple and J.T. Moss (**LWP**). 1♂, 1♀, Mt Sylvia, [S of Gatton], 25.i.1994, M. Coombs; 1♂, 1♀, 10 km S of Mt Sylvia, 5.i.1994, M. Coombs; 1♂, 1♀, Lenthall's Scrub, 22 km NW Maryborough, dry vine forest, 2.i.1990, JM (**MC**). 1♂, Mt White, Coen, 10.i.1964, M.S. Moulds; 2♂, Irvinebank, W of Herberton, 2,9.i.1983, G. Wood; 3♂, 1♀, Forty Mile Scrub, 65 km SW of Mt Garnet, 19.xii.1974, M.S. Moulds, 1♀, same locality, 19.xi.1974, WH; 1♂, same locality, 6.i.1982, G. Wood, 1♀, same locality, 16.i.1980, A. Hiller, 2♀, 29.xii.1985, 16.i.1986, S. Lamond, 2♂, 2♀, malaise trap, 22.xi–4.xii, 4–21.xii.1985, Storey & Heiner; 1♂, Halftide Beach, via Mackay, 27.ii.1973, J. Frost; 1♂, 5♀, Yeppoon 28.i.1983, 15.i.1989, R. Eastwood; 1♀, Yeppoon, 25.xii.1972, Andrew Atkins; 1♀, Mt Etna, near Rockhampton, 7.xii.1980, MBM; 1♀, Edungalba, nr Duaringa, 22.i.1982, MBM; 1♂, 8 miles W of Edungalba, 23.xii.1972 M.S. Moulds; 2♂, 3♀ "Mourangee" nr Edungalba, 14.xii.1983, EA; 7♂, 6♀ "Mourangee" near Edungalba, in soft wood scrub, 14.xi.1987, EA; 7♂, 3♀ 3 km N of Mourangee nr Edungalba, in dry vine scrub, 9,28.xi.1987, EA; 1♂, 5 km N of Mourangee Hsd, nr Edungalba, near scrub, 15.xi.1987, EA; 1♂, 6 km N of Mourangee Hsd, nr Edungalba, 25.x.1986, EA; 2♂, 1♀, 2.5 km E of "Mourangee" Hsd, nr Edungalba, 19.xii.1986, 31.xi.1987, EA; 11♂ (1 genitalia prep. Ps2), 8♀, 3 km E of Mourangee Hsd, nr Edungalba, 5.ii.1983, 29.x.1986, 28.xi.1987, EA; 2♂, 3 km E of Mourangee Hsd, nr Edungalba, 9.xi.1987, in dry vine scrub, EA; 3♂, 4♀, 4 km E of Mourangee Hsd, nr Edungalba, 14.xii.1985, EA; 23♂, 18♀, 4 km E of Mourangee Hsd, nr Edungalba, in dry vine scrub, 19,23,28.i.1991, EA; 5♂, 1♀, Dawson River, 7 km SW of Mourangee Hsd, nr Edungalba, 12.xii.1987, EA; 1♂, 1♀, edge of scrub W of "Mourangee" Hsd, nr Edungalba, 14.xii.1983, EA; 1♂, 1♀, 35 km S of Blackwater, 25.xi.1986, MBM; 7♂ (1 genitalia prep. Ps1), 5♀, 55 km S of Rolleston, 20.xii.1983, MBM; 1♂, 6 km N Taroom, 25°36'S 149°46'E, 8.ii.1991, G. & A. Daniels, C. Burwell; 1♂, Mt.Scoria, Thangool, 21.xi.1987, R. Eastwood; 1♂, 3♀, Mt Scoria, 6 km S Thangool, 24°32'S 150°36'E, 16.i, 5.iii.1991, G. & A. Daniels; 2♂, 1♀, summit, Mt Scoria, 6 km S

Thangool, 24°32'S 150°36'E, 11.ii.1991, G. & A. Daniels, C. Burwell; 1♀, Monto, 18.xii.1979, A. Hiller; 3♂, 1♀, 16 km S of Miles, 19.xii.1987, MBM; 5♂, 1♀, Toowoomba, 14.i.1987, D.A. Lane; 2♂, 9♀, Dunmore State Forest approx. 50 km SW of Dalby, 400 m, 28.i.,15,25.xii.1987, 10.i.1988, A. Hiller; 1♂, Lake Broadwater nr Dalby, 27°21'S 151°06'E, 31.i.1987, G. & A. Daniels; 1♂, 1♀, Weir River, S of Moonie, 22.xii.1989, MBM; 6♂, 18♀, 5 km N Leyburn, 27°58'S 151°38'E, MV lamp, 25.xii.1987, G. & A. Daniels (**MSM**). 11♂, 17♀, Expedition Range NP, "Amphitheatre", 25°13'S 148°59'E, vinescrub, 520 m, 18.xii.1997, mv lamp, Evans, Burwell, Ewart; 7♂, 10♀, Hurdle Gully, 13.3 km WSW of Monto, 24°55'S 150°59'E, 390 m, 20.xii.1987, mv lamp, Burwell, Evans, Ewart; 1♀, Nangur SF, 2nd site, 26°08'S 151°59'E 24.xi.1995–3.ii.1996, rainforest, 320 m, intercept trap, G. Monteith (**QM**). 1♀, Mt Moffat summit, Mt Moffat NP, 15.xii.1987, D.K. Yeates; 1♂, Theodore, 3.ii.1952, J. Letchford; 1♂, Pittsworth, 2.ii.1959; 1♂, Toowoomba, 8.ii.1920, J.A. Beck (**UQIC**). NEW SOUTH WALES: 1♂, 2♀, Yanco, 22.xii.1975 E.L. Jones (**ASCU**). 2♂, 1♀, Warrumbungle National Park, 6.i.1990, JM (**JM**). 1♂, 1♀, Gravesend Mtn, Gravesend, 24.xi.1998, M. Coombs; 1♂, 1♀, Warrumbungle NP, 23.xii.1998, S.L. Winterton; 1♂, 3♀, Moonbi Lookout, Moonbi, 28.xii.1992, M. Coombs; 4♂, Tamworth, 28.xii.1992, M. Coombs (**MC**). 1♂, Yetman, 17.xii.1983, MBM; 2♀, Cocoparra NP, 30 km NE Griffith, 29.xii.1986, M.F. Braby (**MSM**).

Distinguishing characters. Distinguished from other *Psaltoda* species that possess a dominantly black abdomen above (except *P. plaga*) by lacking infuscation around the apices of the hind wings, but possessing fore wing infuscations. Differs from dark individuals of *P. plaga* as stated in couplet 11 of the key to species.

Description

Male (Figs 5, 12, 13). *Head*. Dominated by black markings, otherwise mid brown or partly green; vertex with a broad black fascia between eyes, centrally the black reaching to postclypeus and posterior margin of head, sometimes entirely black on posterior half of vertex except for small brown posterior spot on midline; supra-antennal plates black or partly so, the black sometimes extending to black bar adjoining eyes; eyes encircled black; ventrally with a broad black fascia from eye to antennal socket, sometimes entirely black. Postclypeus very prominent, in dorsal view nearly always protruding beyond the alignment of vertex; glossy; yellowish light brown, black dorsally across base, transverse ridges black becoming less so or unmarked towards anteclypeus and the black never reaching midline, midline marked by a narrow black fascia partly ill-defined on some individuals. Anteclypeus glossy, yellowish brown with a broad, black lateral fascia reaching distal end of anteclypeus. Rostrum with mentum yellowish brown, dark brown or blackish, labium black; reaching to near apices of hind coxae. Antennae black. Head below excluding postclypeus, extensively covered by dense silvery pubescence.

Thorax. Above dominated by black markings, otherwise mid brown or partly green, probably all green or nearly so on live specimens. Pronotum with pronotal collar mid brown to green, edged black to varying degrees; median, lateral and transverse fissures black; a paramedian pair of black fascia between anterior margin and pronotal collar, but not always abutting anterior margin; the black markings anterior to pronotal collar sometimes expanded to cover much of the pronotal surface. Mesonotum with lateral and submedian sigilla usually completely marked black, sometimes the black extending beyond to encompass majority of mesonotum; midline with a black fascia from anterior margin to cruciform elevation, narrowly tapering and pointed anteriorly, abruptly expanded posteriorly between anterior arms of cruciform elevation; wing grooves black; cruciform elevation usually unmarked but sometimes anterior arms are black or partly so. Below yellowish light brown, a little black of varying extent but mostly near leg bases, basisternum 2 where covered by fore legs always jet black, lobe of anepimeron 2 always jet black; substantially covered by dense silvery pubescence.

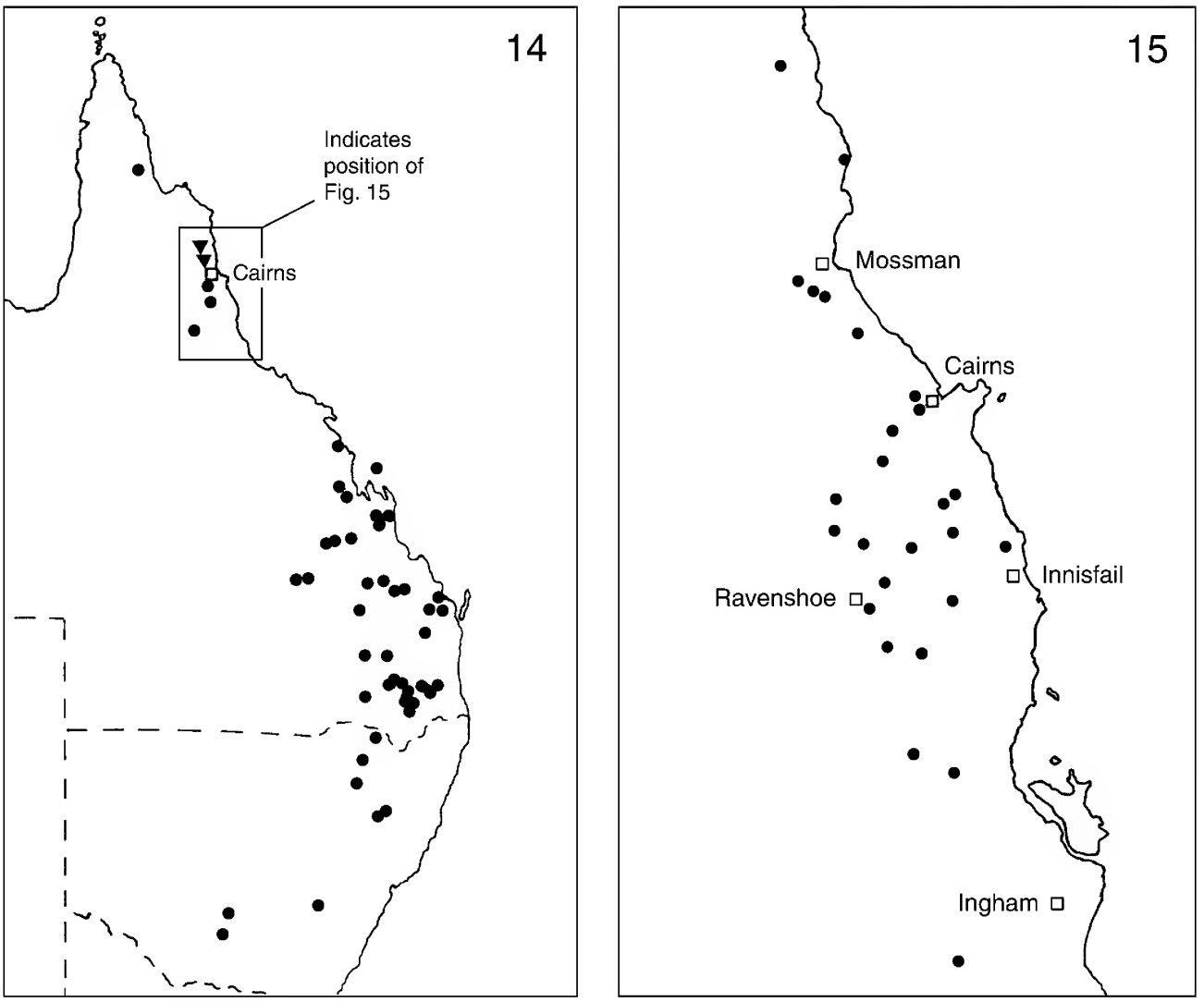
Wings. Hyaline, sometimes with a very faint smoky tint through apical cells. Fore wing venation brown or black, some individuals with costa to node green and sometimes green on stem of vein M, CuA and CuP+1A, costa always black or nearly so distal of node, 2A+3A edged black adjacent to basal membrane; veins forming bases of apical cells 2 and 3 weakly infuscated; sometimes also the faintest hint of infuscation along ambient vein plus longitudinal veins of apical cells 1–8; basal cell translucent brown or green, darkest on anterior half; basal membrane black. Hind wing venation brown, sometimes green on basal half; plaga on 3A black, not quite reaching to distal end; plaga on 2A black, sometimes very narrow, reaching full length.

Legs. Glossy, yellowish light brown. Fore legs with femoral primary spine lying flat, secondary spine small; coxa sometimes with a pair of black fascia along length; femur usually with a single black fascia along length; tibia, tarsus and pretarsal claws always black. Mid leg coxa usually with a basal outer black spot; femur usually with a single black fascia along length; tibia, tarsus and pretarsal claws black except for a small pale streak near proximal end of tibia. Hind coxa usually with a basal outer black spot; distal end of tibia, tarsus and pretarsal claws usually tinted brown. Meracanthus black basally, spine yellowish light brown but sometimes partly black.

Opercula. Lateral and hind margins almost straight, lateral angle broadly rounded; overlapping; lateral margin strongly up-turned; convex; yellowish light brown, but usually with black in the vicinity of meracanthus and at far basal lateral corner.

Abdomen. Tergites tending glossy; jet black with much of the lower half of tergite 3 golden brown, the golden brown rounded across its dorsal extent and usually not quite reaching distal margin of tergite above auditory capsule and on fresh specimens covered by fine silver pubescence; on some specimens some tergites narrowly edged brown on posterior margins to varying extent; reflexed lateral margin of tergites 4–8 golden brown. Tymbal covers tightly aligned with operculum margin; smoky brown to black. Sternites glossy; golden brown, their anterior margins black to varying extent, sternite II mostly black except extreme lateral corners. Spiracles white.

Genitalia (Figs 12, 13). Thickening of lower rim of pygofer very minimal, only slightly greater than remainder. Pygofer basal lobe lying tight against upper lobe; upper lobe extending well beyond height of basal lobe, U-shaped in outline in lateral view. Uncus with distal expansion occupying about one third or less the length of uncal median lobe; distal margin of uncal median lobe not V-shaped but broadly curved; in lateral view curved in an arc along dorsal



Figures 14–15. Distribution of *Psaltoda* species. 14, *Psaltoda maccallumi*, ▼; *Psaltoda mossi*, ●. 15, *Psaltoda antennetta*.

midline with the distal expansion strongly bulging and forming a somewhat trumpet-shaped end to the uncal lobe. Aedeagus similar to that of other *Psaltoda* species.

Female (Fig. 6). Similar to male. Abdominal segment 9 black across entire dorsal surface including caudal spine, otherwise golden brown; oviposition sheath black, terminating before apex of caudal spine.

Measurements. n = 10♂, 10♀ (includes largest and smallest of available specimens). *Body length*: male 26.2–31.7 (29.4); female 20.4–28.4 (23.6). *Fore wing length*: male 32.0–37.6 (34.8); female 30.3–39.4 (34.2). *Head width*: male 11.0–12.9 (11.7); female 10.0–13.0 (11.6). *Pronotum width*: male 9.7–11.3 (10.5); female 8.9–11.9 (10.3).

Distribution and habitat (Fig. 14). Eastern Queensland south from Coen, inland northeastern NSW from near Yetman, Gravesend, the Warrumbungle Ranges and near Tamworth, and also from the Griffith district of inland southern NSW. Adults have been taken from late October to late February but most records are for December. It mostly occurs in softwood scrub and dry vine thickets and there is a loose association with Brigalow Belt vegetation including *Callitris* woodland.

Etymology. Named after Dr John Moss, who collected one of the first specimens and recognised its uniqueness. His enthusiasm for collecting and studying cicadas has contributed enormously to our knowledge and understanding of Australian species. His willingness to encourage others and share information is unending.

Phylogenetic relationships

Psaltoda antennetta and *P. maccallumi* share some attributes that support a sister-group relationship. The male abdomen is minimally rounded along the dorsal midline and the primary spine of the fore leg femur is erect, small and peg-like. As well, the male opercula fall well short of the tymbal covers leaving a wide parallel-sided gap. *Psaltoda*

brachypennis is the only other *Psaltoda* species to possess such a gap but in that species the opercula and tymbal covers converge anteriorly so that the bases of the opercula meet or almost meet the anterior margin of the tymbal covers; like *P. antennetta* and *P. maccallumi* this species also has an erect primary spine on the fore leg femur but it is much larger. Further, the male genitalia of *P. antennetta* and *P. maccallumi* have an uncus that in dorsal view is somewhat arrow-head shaped with straight converging sides angled at less than 90° and meeting to form a rounded apex (compare Figs 9 and 11 with Fig. 13).

The sister species of *P. mossi* is less clear and may best be resolved by a phylogenetic analysis of all species of *Psaltoda* and allied genera, a project beyond the scope of this paper. Colour and markings, wing infuscations and male genitalia suggest affiliation with *P. plaga* (Walker). However, the angular head with its protruding postclypeus and the marked ventral development of abdominal tergite 3 clearly differ from *P. plaga* and most other *Psaltoda* species. These attributes do occur, however, in *P. flavescens* Distant and compatibility with most other attributes suggests *P. mossi* and *P. flavescens* may be sister species. Similar attributes are found in *Neopsaltoda crassa* Distant also, which suggests a sister group relationship between this taxon and *P. mossi/P. flavescens*. The colour and markings of *P. mossi* also are remarkably similar to those of *N. crassa* as is the structure of the male genitalia. The notable differences between *N. crassa* and *P. mossi/P. flavescens* include the exceedingly large abdominal tergites 2 and 3 of *N. crassa* and the erect femoral primary spines of *N. crassa* as opposed to the prostrate primary spines of *P. mossi* and *P. flavescens*.

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